

General

Guideline Title

Management of hyperglycemia in hospitalized patients in non-critical care setting: an Endocrine Society clinical practice guideline.

Bibliographic Source(s)

Umpierrez GE, Hellman R, Korytkowski MT, Kosiborod M, Maynard GA, Montori VM, Seley JJ, Van den Berghe G. Management of hyperglycemia in hospitalized patients in non-critical care setting: an Endocrine Society clinical practice guideline. J Clin Endocrinol Metab. 2012 Jan;97(1):16-38. [PubMed](#)

Guideline Status

This is the current release of the guideline.

Recommendations

Major Recommendations

Definitions for the quality of the evidence (+OOO, ++OO, +++O, and ++++); the strength of the recommendation (1 or 2); and the difference between a "recommendation" and a "suggestion" are provided at the end of the "Major Recommendations" field.

Diagnosis and Recognition of Hyperglycemia and Diabetes in the Hospital Setting

The Task Force recommends that clinicians assess all patients admitted to the hospital for a history of diabetes. When present, this diagnosis should be clearly identified in the medical record. (1 | +OOO)

The Task force suggests that all patients, independent of a prior diagnosis of diabetes, have laboratory blood glucose (BG) testing on admission. (2 | +OOO)

The Task Force recommends that patients without a history of diabetes with BG greater than 7.8 mmol/liter (140 mg/dl) be monitored with bedside point of care (POC) testing for at least 24 to 48 h. Those with BG greater than 7.8 mmol/liter require ongoing POC testing with appropriate therapeutic intervention. (1 | +OOO)

The Task Force recommends that in previously normoglycemic patients receiving therapies associated with hyperglycemia, such as corticosteroids or octreotide, enteral nutrition (EN) and parenteral nutrition (PN) be monitored with bedside POC testing for at least 24 to 48 h after initiation of these therapies. Those with BG measures greater than 7.8 mmol/liter (140 mg/dl) require ongoing POC testing with appropriate therapeutic intervention. (1 | +OOO)

The Task Force recommends that all inpatients with known diabetes or with hyperglycemia (>7.8 mmol/liter) be assessed with a hemoglobin A1C (HbA1C) level if this has not been performed in the preceding 2–3 months. (1 | +OOO)

Monitoring Glycemia in the Non-Critical Care Setting

The Task Force recommends bedside capillary POC testing as the preferred method for guiding ongoing glycemic management of individual patients. (1 | ++OO)

The Task Force recommends the use of BG monitoring devices that have demonstrated accuracy of use in acutely ill patients. (1 | +OOO)

The Task Force recommends that timing of glucose measures match the patient's nutritional intake and medication regimen. (1 | +OOO)

The Task Force suggests the following schedules for POC testing: before meals and at bedtime in patients who are eating, or every 4–6 h in patients who are NPO [receiving nothing by mouth (nil per os)] or receiving continuous enteral feeding. (2 | +OOO)

Glycemic Targets in the Non-Critical Care Setting

The Task Force recommends a premeal glucose target of less than 7.8 mmol/liter (140 mg/dl) and a random BG of less than 180 mg/dl (10.0 mmol/liter) for the majority of hospitalized patients with non-critical illness. (1 | ++OO)

The Task Force suggests that glycemic targets be modified according to clinical status. For patients who are able to achieve and maintain glycemic control without hypoglycemia, a lower target range may be reasonable. For patients with terminal illness and/or with limited life expectancy or at high risk for hypoglycemia, a higher target range (BG <11.1 mmol/liter or 200 mg/dl) may be reasonable. (2 | +OOO)

For avoidance of hypoglycemia, the Task Force suggests that antidiabetic therapy be reassessed when BG values fall below 5.6 mmol/liter (100 mg/dl). Modification of glucose-lowering treatment is usually necessary when BG values are below 3.9 mmol/liter (70 mg/dl). (2 | +OOO)

Management of Hyperglycemia in the Non-Critical Care Setting

Medical Nutrition Therapy (MNT)

The Task Force recommends that MNT be included as a component of the glycemic management program for all hospitalized patients with diabetes and hyperglycemia. (1 | +OOO)

The Task Force suggests that providing meals with a consistent amount of carbohydrate at each meal can be useful in coordinating doses of rapid-acting insulin to carbohydrate ingestion. (2 | +OOO)

Transition from Home to Hospital

The Task Force recommends insulin therapy as the preferred method for achieving glycemic control in hospitalized patients with hyperglycemia. (1 | ++OOO)

The Task Force suggests the discontinuation of oral hypoglycemic agents and initiation of insulin therapy for the majority of patients with type 2 diabetes at the time of hospital admission for an acute illness. (2 | +OOO)

The Task Force suggests that patients treated with insulin before admission have their insulin dose modified according to clinical status as a way of reducing the risk for hypoglycemia and hyperglycemia. (2 | +OOO)

Pharmacological Therapy

The Task Force recommends that all patients with diabetes treated with insulin at home be treated with a scheduled subcutaneous (sc) insulin regimen in the hospital. (1 | ++++)

The Task Force suggests that prolonged use of sliding scale insulin (SSI) therapy be avoided as the sole method for glycemic control in hyperglycemic patients with history of diabetes during hospitalization. (2 | +OOO)

The Task Force recommends that scheduled sc insulin therapy consist of basal or intermediate-acting insulin given once or twice a day in combination with rapid or short-acting insulin administered before meals in patients who are eating. (1 | +++O)

The Task Force suggests that correction insulin be included as a component of a scheduled insulin regimen for treatment of BG values above the desired target. (2 | +OOO)

Transition from Hospital to Home

The Task Force suggests reinstitution of preadmission insulin regimen or oral and non-insulin injectable antidiabetic drugs at discharge for patients with acceptable preadmission glycemic control and without a contraindication to their continued use. (2 | +OOO)

The Task Force suggests that initiation of insulin administration be instituted at least one day before discharge to allow assessment of the efficacy and safety of this transition. (2 | +OOO)

The Task Force recommends that patients and their family or caregivers receive both written and oral instructions regarding their glycemic management regimen at the time of hospital discharge. These instructions need to be clearly written in a manner that is understandable to the person who will administer these medications. (1 | ++OO)

Special Situations

Transition From Intravenous (IV) Continuous Insulin Infusion (CII) to SC Insulin Therapy

The Task Force recommends that all patients with type 1 and type 2 diabetes be transitioned to scheduled sc insulin therapy at least 1–2 h before discontinuation of CII. (1 | ++++)

The Task Force recommends that sc insulin be administered before discontinuation of CII for patients without a history of diabetes who have hyperglycemia requiring more than 2 U/h. (1 | ++++)

The Task Force recommends POC testing with daily adjustment of the insulin regimen after discontinuation of CII. (1 | +++O)

Patients Receiving EN or PN

The Task Force recommends that POC testing be initiated for patients with or without a history of diabetes receiving EN and PN. (1 | ++++)

The Task Force suggests that POC testing can be discontinued in patients without a prior history of diabetes if BG values are less than 7.8 mmol/liter (140 mg/dl) without insulin therapy for 24–48 h after achievement of desired caloric intake. (2 | +OOO)

The Task Force suggests that scheduled insulin therapy be initiated in patients with and without known diabetes who have hyperglycemia, defined as BG greater than 7.8 mmol/liter (140 mg/dl), and who demonstrate a persistent requirement (i.e. >12 to 24 h) for correction insulin. (2 | +OOO)

Perioperative BG Control

The Task Force recommends that all patients with type 1 diabetes who undergo minor or major surgical procedures receive either CII or sc basal insulin with bolus insulin as required to prevent hyperglycemia during the perioperative period. (1 | ++++)

The Task Force recommends discontinuation of oral and noninsulin injectable antidiabetic agents before surgery with initiation of insulin therapy in those who develop hyperglycemia during the perioperative period for patients with diabetes. (1 | +OOO)

When instituting sc insulin therapy in the postsurgical setting, the Task Force recommends that basal (for patients who are NPO) or basal bolus (for patients who are eating) insulin therapy be instituted as the preferred approach. (1 | +++O)

Glucocorticoid-Induced Diabetes

The Task Force recommends that bedside POC testing be initiated for patients with or without a history of diabetes receiving glucocorticoid therapy. (1 | +++O)

The Task Force suggests that POC testing can be discontinued in nondiabetic patients if all BG results are below 7.8 mmol/liter (140 mg/dl) without insulin therapy for a period of at least 24–48 h. (2 | +OOO)

The Task Force recommends that insulin therapy be initiated for patients with persistent hyperglycemia while receiving glucocorticoid therapy. (1 | ++OO)

The Task Force suggests CII as an alternative to sc insulin therapy for patients with severe and persistent elevations in BG despite use of scheduled basal bolus sc insulin. (2 | +OOO)

Recognition and Management of Hypoglycemia in the Hospital Setting

The Task Force recommends that glucose management protocols with specific directions for hypoglycemia avoidance and hypoglycemia management be implemented in the hospital. (1 | ++OO)

The Task Force recommends implementation of a standardized hospital-wide, nurse-initiated hypoglycemia treatment protocol to prompt immediate therapy of any recognized hypoglycemia, defined as a BG below 3.9 mmol/liter (70 mg/dl). (1 | ++OO)

The Task Force recommends implementation of a system for tracking frequency of hypoglycemic events with root cause analysis of events

associated with potential for patient harm. (1 | ++OO)

Implementation of a Glycemic Control Program in the Hospital

The Task Force recommends that hospitals provide administrative support for an interdisciplinary steering committee targeting a systems approach to improve care of inpatients with hyperglycemia and diabetes. (1 | +++O)

The Task Force recommends that each institution establish a uniform method of collecting and evaluating point of care (POC) testing data and insulin use information as a way of monitoring the safety and efficacy of the glycemic control program. (1 | +OOO)

The Task Force recommends that institutions provide accurate devices for glucose measurement at the bedside with ongoing staff competency assessments. (1 | +OOO)

Patient and Professional Education

The Task Force recommends diabetes self-management education targeting short-term goals that focus on survival skills: basic meal planning, medication administration, BG monitoring, and hypoglycemia and hyperglycemia detection, treatment, and prevention. (1 | +OOO)

The Task Force recommends identifying resources in the community to which patients can be referred for continuing diabetes self-management education after discharge. (1 | +OOO)

The Task Force recommends ongoing staff education to update diabetes knowledge, as well as targeted staff education whenever an adverse event related to diabetes management occurs. (1 | +OOO)

Definitions:

Quality of the Evidence

+OOO Denotes very low quality evidence

++OO Denotes low quality evidence

+++O Denotes moderate quality evidence

++++ Denotes high quality evidence

Strength of Recommendations

1 - Indicates a strong recommendation and is associated with the phrase "The Task Force recommends."

2 - Denotes a weak recommendation and is associated with the phrase "The Task Force suggests."

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

- Type 1 diabetes mellitus (T1DM)
- Type 2 diabetes mellitus (T2DM)
- Hyperglycemia (e.g. stress hyperglycemia, medication-induced hyperglycemia)

Guideline Category

Counseling

Diagnosis

Management

Risk Assessment

Treatment

Clinical Specialty

Endocrinology

Family Practice

Internal Medicine

Nursing

Nutrition

Pharmacology

Intended Users

Advanced Practice Nurses

Dietitians

Hospitals

Nurses

Pharmacists

Physician Assistants

Physicians

Guideline Objective(s)

To formulate practice guidelines on the management of hyperglycemia in hospitalized patients in the non-critical care setting

Target Population

Hospitalized patients in non-critical care settings who have diagnosed or suspected type 1 diabetes mellitus (T1DM) or type 2 diabetes mellitus (T2DM) or "stress hyperglycemia"

Interventions and Practices Considered

Diagnosis/Assessment

1. Assessment at admission for history or presence of diabetes
2. Blood glucose (BG) testing on admission
3. Point of care (POC) assessments in cases of elevated BG
4. POC assessments in cases of treatment with drugs or diets associated with hyperglycemia
5. Hemoglobin A1c (HbA1c) testing in cases of known diabetes or hyperglycemia

Monitoring/Treatment

1. Bedside capillary POC testing
2. Use of BG monitoring devices
3. Monitoring in relation to nutritional intake
4. POC testing schedules
5. Glycemic targets
6. Medical nutrition therapy (MNT)
7. Use of intravenous or subcutaneous insulin injections in hospital
8. Coordination of insulin type to feeding
9. Modification of insulin doses, as needed
10. Timing of reinstitution of preadmission insulin regimen or oral and non-insulin therapy
11. Monitoring in patients receiving enteral or parenteral nutrition
12. Perioperative BG control
13. Monitoring in cases of glucocorticoid-induced diabetes

Counseling/Management

1. Patient and home caregiver education for self-management
2. Identification of community resources for the patient
3. Use of an interdisciplinary steering committee for a systems approach to improve inpatient care
4. Establishment of uniform protocols for monitoring and management of hyperglycemia and hypoglycemia
5. Staff competency assessments
6. Ongoing staff education

Major Outcomes Considered

- Mortality
- Incidence of myocardial infarction
- Incidence of stroke
- Incidence of infection
- Incidence of hypoglycemia
- Sensitivity and specificity of diagnostic tests for diabetes
- Effectiveness and safety of glucose control regimens
- Adverse effects of drugs for glucose control
- Length of hospital stay
- Hospitalization costs
- Incidence of posthospitalization disability

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Data Sources and Search Strategies

The Task Force conducted a comprehensive search of several databases (from database inception through February 2010) focusing on adults and without language restrictions. The databases included Ovid Medline In-Process & Other Non-Indexed Citations, Ovid MEDLINE, Ovid EMBASE, Ovid Cochrane Database of Systematic Reviews, Ovid Database of Abstracts of Reviews of Effects, Ovid Health Technology Assessment, and Scopus.

The search strategy was designed and conducted by an experienced reference librarian with input from the study's principal investigator. Controlled vocabulary supplemented with keywords was used to define the concept areas: hyperglycemia, hospitalized adults, diabetes mellitus therapy, treatment, and outcomes. The detailed strategy is available in the Supplemental Data (published on The Endocrine Society's Journals Online web site at <http://jcem.endojournals.org> []). In addition, the Task Force supplemented the search by contacting experts in the field to confirm the identification of all potentially eligible reports.

Eligibility Criteria

Studies eligible for inclusion in this review are original articles describing analytic studies (observational or randomized) that compared the effect of intensive glycemic control (of variable definitions) to a control group seeking less aggressive normalization of glycemic levels. Studies had to enroll adult patients hospitalized in non-intensive care settings and measure the outcomes of interest (mortality, stroke, myocardial infarction, the incidence of infections, or hypoglycemia). The Task Force included studies conducted in medical and surgical floors and excluded several randomized trials exclusively conducted in intensive care settings. Thus, some of the included studies have likely included a brief intensive care unit stay. They excluded studies of patients admitted for the initiation of insulin therapy.

Study Selection and Quality Assessment

Two reviewers working independently conducted all study selection, data extraction, and quality assessment. Data were extracted using standardized online forms with real-time monitoring of agreement among reviewers assessed using the kappa statistic, which averaged at least 0.85. Study selection was conducted by applying inclusion/exclusion criteria to study abstracts and then to the full text of the articles.

Number of Source Documents

19 studies were included in the final analysis.

Methods Used to Assess the Quality and Strength of the Evidence

Expert Consensus

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Quality of the Evidence

+OOO Denotes very low quality evidence

++OO Denotes low quality evidence

+++O Denotes moderate quality evidence

++++ Denotes high quality evidence

Methods Used to Analyze the Evidence

Meta-Analysis

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Systematic Review

The systematic review followed a protocol established a priori and approved by the commissioning task force from The Endocrine Society. The review is conducted following recommendations from the Cochrane collaboration and reported following recommendations in the PRISMA (preferred reporting items for systematic reviews and meta-analyses) statement. The quality of overall evidence was graded using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) framework.

Data Extraction

Reviewers extracted data regarding the description of the population and intervention and assessed the risk of bias in the studies using the elements of allocation concealment, blinding, and loss to follow-up (for randomized trials); and cohort selection, outcome assessment, loss to follow-up, and the extent of adjustment for confounders (for observational studies).

Analysis

The Task Force conducted a meta-analysis to determine the effect of intensive glycemic control strategies on the outcomes of death, stroke, myocardial infarction, incidence of infection, and hypoglycemia.

The Task Force pooled relative risks (RR) and associated 95% confidence intervals (CI) from included studies using a random effects model and assessed heterogeneity across studies using the I^2 statistic, which represents the proportion of heterogeneity that is not attributable to chance (i.e. differences in the estimated effect size that are likely due to real differences in studies populations, interventions, or outcomes). The Task Force planned a priori to conduct subgroup analyses based on whether studies were randomized (vs. observational), the setting (medical vs. surgical), and whether the planned glycemic target was achieved (vs. not achieved). A significant ($P < 0.05$) test of interaction suggests possible explanation of observed heterogeneity.

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

The Clinical Guidelines Subcommittee of The Endocrine Society deemed the management of hyperglycemia in hospitalized patients in a non-critical care setting a priority area in need of practice guidelines and appointed a Task Force to formulate evidence-based recommendations.

Participants

The Task Force was composed of a chair, selected by the Clinical Guidelines Subcommittee of The Endocrine Society, six additional experts, and a methodologist.

Evidence

The Task Force followed the approach recommended by the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) group, an international group with expertise in development and implementation of evidence-based guidelines. A detailed description of the grading scheme has been published elsewhere. The Task Force used the best available research evidence to develop some of the recommendations. The Task Force also used consistent language and graphical descriptions of both the strength of a recommendation and the quality of evidence.

In terms of the strength of the recommendation, strong recommendations use the phrase "The Task Force recommends" and the number 1, and weak recommendations use the phrase "The Task Force suggests" and the number 2. The symbols +OOO denotes very low quality evidence; ++OO, low quality; +++O, moderate quality; and +++++, high quality. The Task Force has confidence that persons who receive care according to the strong recommendations will derive, on average, more good than harm. Weak recommendations require more careful consideration of the person's circumstances, values, and preferences to determine the best course of action.

Linked to each recommendation in the original guideline document is a description of the evidence and the values that panelists considered in making the recommendation; in some instances, there are remarks, a section in which panelists offer technical suggestions for testing conditions, dosing, and monitoring. These technical comments reflect the best available evidence applied to a typical person being treated. Often this evidence

comes from the unsystematic observations of the panelists and their values and preferences; therefore, these remarks should be considered suggestions.

Consensus Process

One group meeting, several conference calls, and e-mail communications enabled consensus.

Rating Scheme for the Strength of the Recommendations

Strength of Recommendations

1 - Indicates a strong recommendation and is associated with the phrase "The Task Force recommends."

2 - Denotes a weak recommendation and is associated with the phrase "The Task Force suggests."

Cost Analysis

Published cost analyses were reviewed.

Method of Guideline Validation

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

Endocrine Society members, American Diabetes Association, American Heart Association, American Association of Diabetes Educators, European Society of Endocrinology, and the Society of Hospital Medicine reviewed and commented on preliminary drafts of this guideline.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is specifically stated for each recommendation (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Appropriate management of hyperglycemia in patients hospitalized in non-critical care settings

Potential Harms

Sulfonylureas are long-acting insulin secretagogues that can cause severe and prolonged hypoglycemia, particularly in the elderly, in patients with impaired renal function, and in those with poor nutritional intake. There are no data on hospital use of the short-acting insulin secretagogues repaglinide and nateglinide; however, the risk of hypoglycemia is similar to that with sulfonylureas, suggesting the need for caution in the inpatient setting.

Contraindications

Contraindications

- The use of oral and other non-insulin therapies presents unique challenges in the hospital setting because there are frequent contraindications to their use in many inpatient situations (sepsis, NPO [receive nothing by mouth] status, intravenous contrast dye, pancreatic disorders, renal failure, etc.)
- Metformin must be discontinued in patients with decompensated congestive heart failure, renal insufficiency, hypoperfusion, or chronic pulmonary disease and in patients who are at risk of developing renal failure and lactic acidosis, such as may occur with the administration of intravenous contrast dye or surgery.
- Thiazolidinediones (TZD) can take several weeks for the full hypoglycemic effect, thus limiting the usefulness of these agents for achieving glycemic control in the hospital. These agents are contraindicated in patients with congestive heart failure, hemodynamic instability, or evidence of hepatic dysfunction.

Qualifying Statements

Qualifying Statements

- Clinical Practice Guidelines are developed to be of assistance to endocrinologists and other health care professionals by providing guidance and recommendations for particular areas of practice. The Guidelines should not be considered inclusive of all proper approaches or methods, or exclusive of others. The Guidelines cannot guarantee any specific outcome, nor do they establish a standard of care. The Guidelines are not intended to dictate the treatment of a particular patient. Treatment decisions must be made based on the independent judgment of health care providers and each patient's individual circumstances.
- The Endocrine Society makes no warranty, express or implied, regarding the Guidelines and specifically excludes any warranties of merchantability and fitness for a particular use or purpose. The Society shall not be liable for direct, indirect, special, incidental, or consequential damages related to the use of the information contained herein.

Implementation of the Guideline

Description of Implementation Strategy

The Task Force provides recommendations for implementation of a glycemic control program in the hospital. See the "Major Recommendations" field for further information.

Implementation Tools

Patient Resources

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Living with Illness

IOM Domain

Effectiveness

Patient-centeredness

Safety

Identifying Information and Availability

Bibliographic Source(s)

Umpierrez GE, Hellman R, Korytkowski MT, Kosiborod M, Maynard GA, Montori VM, Seley JJ, Van den Berghe G. Management of hyperglycemia in hospitalized patients in non-critical care setting: an Endocrine Society clinical practice guideline. J Clin Endocrinol Metab. 2012 Jan;97(1):16-38. [PubMed](#)

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2012 Jan

Guideline Developer(s)

The Endocrine Society - Professional Association

Source(s) of Funding

The Endocrine Society

Guideline Committee

Inpatient Diabetes Management Task Force

Composition of Group That Authored the Guideline

Task Force Members: Guillermo E. Umpierrez (*Chair*); Richard Hellman; Mary T. Korytkowski; Mikhail Kosiborod; Gregory A. Maynard; Victor M. Montori; Jane J. Seley; Greet Van den Berghe

Financial Disclosures/Conflicts of Interest

Financial Disclosures of the Task Force

Guillermo E. Umpierrez, M.D. (chair) — Financial or Business/Organizational Interests: none declared; Significant Financial Interest or Leadership Position: none declared

Richard Hellman, M.D., FACP — Financial or Business/Organizational Interests: none declared; Significant Financial Interest or Leadership

Position: none declared

Mary T. Korytkowski, M.D. — Financial or Business/Organizational Interests: Consultant, Lilly Pharmaceuticals; Significant Financial Interest or Leadership Position: none declared

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Greet Van den Berghe, M.D., Ph.D. — Financial or Business/Organizational Interests: Glysure (UK); Significant Financial Interest or Leadership Position: none declared

*Evidence-based reviews for this guideline were prepared under contract with The Endocrine Society.

Guideline Endorser(s)

American Association of Diabetes Educators - Medical Specialty Society

American Diabetes Association - Professional Association

American Heart Association - Professional Association

European Society of Endocrinology - Medical Specialty Society

Society for Hospital Medicine - Professional Association

Guideline Status

This is the current release of the guideline.

Guideline Availability

Electronic copies: Available in Portable Document Format (PDF) from [The Endocrine Society Web site](#) .

Print copies: Available from The Endocrine Society, Phone: (301) 941.0210; Email: Societyservices@endo-society.org

Availability of Companion Documents

The following is available:

- Murad MH, Coburn JA, Coto-Yglesias, Dzyubak S, Hazem A, Lane MA, Prokop LJ, Montori VM. Glycemic control in non-critically ill hospitalized patients: a systematic review and meta-analysis. Clin Endocrinol Metab. 2012 Jan. 97(1):49–58. Electronic copies: Available to subscribers from the [Journal of Clinical Endocrinology & Metabolism Web site](#) .

Patient Resources

The following is available:

- Patient guide to managing hyperglycemia (high blood sugar) in the hospital. The Hormone Foundation. 2012 Jan. 2 p. Electronic copies:

Please note: This patient information is intended to provide health professionals with information to share with their patients to help them better understand their health and their diagnosed disorders. By providing access to this patient information, it is not the intention of NGC to provide specific medical advice for particular patients. Rather we urge patients and their representatives to review this material and then to consult with a licensed health professional for evaluation of treatment options suitable for them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

NGC Status

This NGC summary was completed by ECRI Institute on June 12, 2012. The information was verified by the guideline developer on June 22, 2012. This summary was updated by ECRI Institute on April 15, 2016 following the U.S. Food and Drug Administration advisory on Metformin-containing Drugs.

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